1,152,170

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,152,170

Inventor: WILLIAM HENRY WHEELER

Date of Application and filing Complete Specification: 4 July, 1966.

No. 41183/68.

(Divided out of No. 1,151,214.)

Complete Specification Published: 14 May, 1969.

Index at acceptance:—H5 H(1J1, 2E4SY)

Int. Cl.:—H 05 b 3/18

COMPLETE SPECIFICATION

Improvements relating to the Heating of Fluids, such as Fuel Oils

We, URQUHART'S (1926) LIMITED, a British Company, of 5, Wadsworth Road, Perivale, Greenford, Middlesex, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns the rapid and controlled heating of fluids, more particularly the heating of viscous liquids, such as fuel oils, by means of electric power.

In the heating of liquids it is common practice to immerse a heating element, usually of tubular form, into the liquid contained in a tank or container; such devices being known as immersion heaters.

Where viscous liquids are to be heated the natural convection currents in the liquid are slow, and, therefore, the heat distribution might be slow and uneven. Thus there is the danger of overheating the liquid in the vicinity of the heating element itself, unless some mechanical stirring device is also employed. Furthermore, upon shutting off the heat, there is a relatively large heat content in the heating element which may cause physical or chemical change in the liquid, when the liquid has ceased to flow through and over the heater.

In the oil-burning industry it is common practice to use electrical immersion heaters for heating oil, as described above. Such heated oil containers are usually large and have rather high thermal inertia; that is to say, heating up and cooling down rates.

The present invention overcomes the above disadvantages and gives, in particular, great compactness and low thermal inertia. The invention achieves a large heating surface, and relatively high velocity of the liquid over such heating surface.

Accordingly the present invention provides a fluid heating device wherein at least one tubular electrical heating element is arranged in one or more convolutions, at least one fluid duct through which flows the fluid to be heated is formed in similar convolutions and is disposed adjacent the one or more convolutions of the heating element, the at least one heating element and the at least one fluid duct being each wound in a concentric flat spiral and the whole being encast in a heat conducting metal which fills the interstices between the various convolutions and constitutes a block in the form of a flat pancake of which the exterior faces are at least predominantly composed of the cast metal.

The fluid duct or ducts are preferably formed of copper or steel tubing of circular section and are encast, together with the heating element or elements, in aluminium metal.

The tubular electrical heating elements are preferably ceramic-filled metal tubes such as are commonly employed for hot-plates, in which electric resistance wires are embedded in a compressed ceramic powder.

Heating units can be standardised and arranged in series, or parallel, in accordance with the temperature required and the flow rate of the liquid. The heating units are arranged with surrounding thermal insulation in cylindrical, rectangular or other shaped boxes.

In order that the invention may be more readily understood, an embodiment thereof will now be described, by way of example, with reference to the accompanying drawing, wherein the single Figure is a part-sectional perspective view of a pancake heater.

The heating unit illustrated in the Figure includes a tubular electrical heating element 31 comprising a preferably ceramic filled resistance heating element of circular section which is wound in a flat spiral with the convolutions spaced apart laterally. Tubular fluid ducts 33 wound similarly are disposed above and below adjacent the heating element 31. The ducts 33 are comprised by tubes of round section, and the tubes preferably are wound more tightly than is the heating element 31 but again the convolutions need not be in lateral contact. The interstices between the convo-

[*Price 4s. 6d.*]

lutions of the fluid ducts 33 and of the heating element 31, and between the ducts and the heating element are filled by a heat conducting metal 34, suitably aluminium, which is cast around the ducts 33 and the heating element 31 while they are maintained in the disposition described. A pancake heating unit of monoblock construction is provided by this arrangement in which a large heating surface is provided by the encasting metal in contact with the walls of the ducts 33. Each exterior surface of the heating unit is an unbroken surface of the cast metal 34 as illustrated, although it is contemplated that any exterior surface may contain a part of a tube wall.

The top and bottom ducts 33 of the pancake heater shown in the Figure may form two separate fluidways for parallel flow of fluid through the top and bottom ducts respectively or, as indicated, be combined to form one fluidway whereby fluid may enter the heater at point 4, be suitably transferred as indicated by line 5 and may leave the heater at point 6. The pancake heater is not necessarily circular — it could be of oblong or any other suitable shape. it is also within the scope of this construction that more than a single heating element may be provided and also that more than two fluid passageways may be comprised by the ducts 33, and it will further be apparent that this construction is not restricted to the single sandwich construction illustrated in the Figure but may be extended in constructions where flat spirally wound fluid ducts and heating elements alternate within a single block of cast metal 34.

WHAT WE CLAIM IS:—

1. A fluid heating device wherein at least one tubular electrical heating element is arranged in one or more convolutions, at least one fluid duct through which flows the fluid to be heated is formed in similar convolutions and is disposed adjacent the one or more convolutions of the heating element, the at least one heating element and the at least one fluid duct being each wound in a concentric flat spiral and the whole being encast in a heat conducting metal which fills the interstices between the various convolutions and constitutes a block in the form of a flat pancake of which the exterior faces are at least predominantly composed of the cast metal.

2. A fluid heating device according to claim 1, wherein the heat conducting metal is aluminium.

3. A fluid heating device according to claim 1 or claim 2, in which the at least one fluid duct is constituted by copper or steel tubing.

4. A fluid heating device according to claim 1, claim 2 or claim 3 in which the various convolutions are entirely embedded within the heat conducting metal.

5. A fluid heating device according to any one of claims 1 to 4 in which the at least one spiral heating element is positioned within the heat conducting metal between upper and lower spiral fluid ducts.

6. A fluid heating device according to claim 5, wherein the ducts are connected such that the fluid to be heated flows first through the upper fluid duct and thence through the lower duct.

7. A fluid heating device according to claim 5, wherein the upper fluid duct and the lower duct are arranged to provide separate fluidways for flow of the fluid to be heated.

8. A fluid heating device according to any one of the preceding claims, wherein the or each electrical heating element consists of a metal tube filled with a compressed ceramic powder in which is embedded an electric resistance heating wire or wires.

9. A fluid heating device according to any one of the preceding claims further comprising a sheathing of heat-insulating material and an outer casing.

10. A fluid heating device constructed substantially as hereinbefore described with reference to the accompanying drawing.

11. A heater for viscous fuel oils comprising the fluid heating device as claimed in any one of the preceding claims.

STEVENS, LANGNER,
PARRY & ROLLINSON,
Chartered Patent Agents,
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1969.
Published by the Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained.

1152170 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*